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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,994	10/03/2003	Hiroyuki Shimada	59521 (48229)	8918
21874	7590	03/30/2006	EXAMINER	
EDWARDS & ANGELL, LLP P.O. BOX 55874 BOSTON, MA 02205			CHEN, KIN CHAN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 03/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/678,994

Applicant(s)

SHIMADA, HIROYUKI

Examiner

Kin-Chan Chen

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2006.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5 and 10-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5 and 10-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 28, 2006 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2, 4, 10, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzawa et al. (US 6,773,996).

In a method for semiconductor device fabrication, Suzawa teaches that an insulating layer (such as silicon oxide or silicon nitride, e.g., col. 17, line 47) may be

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formed above a semiconductor layer. A conductive layer including at least one of a tantalum layer and a tantalum nitride layer may be formed (e.g., col. 8, lines 40-47). The conductive layer may be etched by using a gas including NF_3 and fluorocarbon. The conductive layer may be etched by using a gas including SiCl_4 and NF_3 . See col. 8, lines 40-47; col. 11, line 35 through col. 12. Specifically, Suzawa (col. 10, Table 1) shows that the angle is a function of process parameters, for example, condition 1 produces 80 degree, and condition 4 produces 70 degree. Suzawa also discloses that the etched conductive layer **may be almost vertical (col. 11, lines 10-11)**.

The above-cited claims differ from Suzawa by specifying various compositions (e.g., ratio of the flow rate of etchant) and processing parameters. However, same were known to be result effective variables (see Table I and II as evidence) and commonly determined by routine experiment. The process of conducting routine experimentations (optimizations) so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, which is different in kind and not merely in degree from the results of the prior art, A person having ordinary skill in the art would have found it obvious to modify admitted prior art by performing routine experiments (by using various compositions and different processing parameters) to obtain optimal result. Dependant claims 10, and 11 differ from Suzawa by specifying various angles / dimensions of the etched product (e.g., angles between the etched conductive layer and the insulating layer). Same are merely a matter of choices of design depending on the product requirements, since same etchants are being used, it would be obvious to one skilled in the art to modify the

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process parameters so as to achieve the desired etch selectivity, and therefore various angles /dimensions of the etched product in order to accommodate the specific product design and meet the product requirement. See also col. 10, Table 1, Suzawa shows that said angle is a function of process parameters, for example, condition 1 produces 80 degree, and condition 4 produces 70 degree.

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). *In re Woodruff*, 16USPQ2d 1934,1936 (Fed. Cir.1990); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.

“ The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation where in a disclosed set of percent ranges is the optimum combination of percentages” *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382-83 (Fed.Cir. 2003).

4. Claims 5 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzawa et al. (US 6,773,996) in view of JP 2001-298193.

In a method for semiconductor device fabrication, Suzawa teaches that an insulating layer (such as silicon oxide or silicon nitride, e.g., col. 17, line 47) may be formed above a semiconductor layer. A conductive layer including at least one of a tantalum layer and a tantalum nitride layer may be formed (e.g., col. 8, lines 40-47). The conductive layer may be etched by using a gas including NF_3 and fluorocarbon. The conductive layer may be etched by using a gas including SiCl_4 and NF_3 . See col. 8, lines 40-47; col. 11, line 35 through col. 12. Specifically, Suzawa (col. 10, Table 1) shows that the angle is a function of process parameters, for example, condition 1 produces 80 degree, and condition 4 produces 70 degree. Suzawa also discloses that the etched conductive layer **may be almost vertical (col. 11, lines 10-11).**

Unlike the claimed invention, Suzawa does not disclose that a first tantalum nitride layer, body centered cubic lattice phase tantalum layer, and a second tantalum nitride layer may be formed and etched. In a method of semiconductor device fabrication, JP 2001-298193 (abstract; [0037]) teaches that a gate electrode of MOSFET may have the structure of a first tantalum nitride layer, body centered cubic lattice phase tantalum layer, and a second tantalum nitride layer. Suzawa teaches working a gate electrode by dry etching. Suzawa is not particular about the gate electrode being working on. Hence, it would have been obvious to one with ordinary skill in the art to work the structure of JP 2001-298193 in the process of Suzawa so as to form a gate electrode of MOSFET.

The above-cited claims differ from Suzawa by specifying various composition (e.g., ratio of the flow rate of etchant) and processing parameters (such as claim 5). However, same were known to be result effective variables and commonly determined by routine experiment. The process of conducting routine experimentations (optimizations) so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, which is different in kind and not merely in degree from the results of the prior art, a person having ordinary skill in the art would have found it obvious to modify admitted prior art by performing routine experiments (by using various compositions and different processing parameters) to obtain optimal result. Dependant claim12 differs from Suzawa by specifying various angles / dimensions of the etched product (e.g., angles between the etched conductive layer and the insulating layer). Same are merely a

matter of choices of design depending on the product requirements, since same etchants are being used, it would be obvious to one skilled in the art to modify the process parameters so as to achieve the desired etch selectivity, and therefore various angles /dimensions of the etched product in order to accommodate the specific product design and meet the product requirement. See also col. 10, Table 1, Suzawa shows that said angle is a function of process parameters, for example, condition 1 produces 80 degree, and condition 4 produces 70 degree.

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). *In re Woodruff*, 16USPQ2d 1934,1936 (Fed. Cir.1990); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809; *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). MPEP 2144.05 II.

Response to Arguments

5. Applicant's arguments filed February 28, 2006 have been fully considered but they are not persuasive.

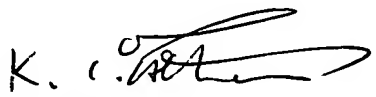
Applicant has argued that Suzawa does not teach Suzawa teach that the angle between the etched conductive surface and the surface of the insulating layer to be substantially vertical. It is not persuasive. As has been stated in the office action, Suzawa also discloses that the etched conductive layer **may be almost vertical (col. 11, lines 10-11)**. Same are merely a matter of choices of design depending on the product requirements, since same etchants are being used, it would be obvious to one skilled in the art to modify the process parameters so as to achieve the desired etch selectivity, and therefore various angles /dimensions of the etched product in order to

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accommodate the specific product design and meet the product requirement. See also col. 10, Table 1, Suzawa shows that said angle is a function of process parameters, for example, condition 1 produces 80 degree, and condition 4 produces 70 degree.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

March 27, 2006


Kin-Chan Chen
Primary Examiner
Art Unit 1765